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(54) A BRUSH CARRIER ASSEMBLY FOR AN ELECTRICAL  
 MACHINE

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 POUR L'EQUIPEMENT ELECTRIQUE  
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 Moulineaux, do hereby declare the in-  
 vention, for which we pray that a patent may  
 be granted to us, and the method by which it  
 is to be performed, to be particularly  
 described in and by the following  
 statement:—

The present invention relates to an  
 electrical machine brush carrier assembly,  
 particularly but not solely one suitable for  
 use with a two-track collecting ring elec-  
 trically connected to a rotor winding of a  
 rotary electric machine, such for example as  
 an alternator adapted for the electric supply  
 of a motor vehicle.

It is known that, in one of the current  
 types of motor vehicle alternators, the  
 winding of the rotor is fed from a two-track  
 collecting ring, each of the two tracks being  
 connected to one of the ends of the rotor  
 winding; a respective brush which is itself  
 connected electrically to the electric supply  
 of the vehicle rubs against each of the tracks  
 of the collecting ring, one of the brushes  
 being connected to earth (negative terminal)  
 and the other being connected to the output  
 of a regulator (positive terminal). Generally,  
 the assembly of the brush carriers is  
 relatively complicated and difficult.

According to a first aspect of the in-  
 vention there is provided an electrical  
 machine brush carrier assembly comprising  
 a fixing plate adapted to be applied against  
 an end-plate of a stator of the machine, a  
 carrier block secured to the fixing plate, at  
 least two wells formed in the carrier block,  
 each well containing a brush, the two wells  
 being arranged in a line perpendicular to the  
 fixing plate, one end of the well which is  
 nearest the fixing plate being covered with a  
 metal strip having an extension providing a  
 terminal and projecting through the said

fixing plate, the said metal strip being  
 connected electrically to a lead of the brush  
 of the well which it covers, and one end of  
 the well which is furthest from the fixing  
 plate having a further strip mounted over it  
 which, after folding, lies along a rear face of  
 the fixing plate, the said further strip being  
 electrically connected to a lead of the brush  
 arranged in the well which it covers.

According to a second aspect of the  
 invention there is provided a rotary elec-  
 trical machine comprising a stator and a  
 rotor, the rotor having a winding supplied by  
 a two-track collecting ring by means of a  
 brush carrier assembly cooperating with the  
 said collecting ring, the brush carrier  
 assembly being fixed on an end-plate of the  
 stator, and being an assembly according to  
 the first aspect of the invention.

The invention will now be described in  
 more detail, by way of example only, with  
 reference to the accompanying drawings, in  
 which:—

Figure 1 shows in axial section, an end-  
 plate of a motor vehicle alternator with a  
 brush carrier assembly embodying the  
 invention, the collector and the  
 corresponding rotor shaft being shown in  
 broken lines;

Figure 2 is a view in the direction of the  
 arrows II—II of Figure 1;

Figure 3 is a view from above of the brush  
 carrier assembly of Figure 1; the upper end  
 face of the carrier block, which is remote  
 from the end which the two brushes project,  
 being covered by a watertight seal  
 over which are mounted two metallic strips  
 respectively connected electrically to the  
 two brushes of the brush carrier  
 assembly.

Figure 4 shows a section along the line  
 IV—IV of Figure 3, the brushes not being in  
 position;

Figure 5 shows a section along the line  
 V—V of Figure 3, the corresponding brush  
 being shown in position in that well which is  
 sectioned;

Figure 6 shows a view from below of the

brush carrier assembly of Figure 1, the end face of the brush carrier assembly from which the two brushes project being provided with a watertight seal provided by a member in the shape of a U;

Figure 7 shows a plan view of the watertight seal provided in the upper part of the brush carrier assembly embodying the invention;

Figure 8 shows a section along the line VIII—VIII of the watertight seal of Fig. 7;

Figure 9 shows a plan view of the watertight seal provided in the lower part of the brush carrier assembly embodying the invention; and

Figure 10 shows a view along the line X—X of the watertight seal of Fig. 9.

Referring to the drawings, the rear end-plate of an alternator for producing the electrical supply of a motor vehicle has been generally referenced by 100.

This alternator, now shown in its entirety, comprises a stator ring inserted between the end-plate 100 and a front end-plate, not shown, which support the bearings of the rotor shaft; the front end-plate is that which is near the fan and the drive pulley if the rotor; the rear end-plate 100 is that which is situated facing the two track collecting ring 101 placed on the shaft 102 of the rotor. The end of the shaft 102 which is near the ring 101 is supported in the end-plate 100 by a roller bearing 103. The rear end-plate 100 is formed of a light moulded alloy and has a continuous rim 100a connected by an apertured radial wall to a central sleeve 100b for receiving the bearing 103. The apertured radial wall of the end-plate is provided with different radial fins 100c which separate the ventilation apertures.

At the upper part of the radial wall of the end-plate 100 (in the position where this end-plate is shown in Figures 1 and 2) an aperture of substantially square shape 104 is provided. This aperture is bounded at its upper part by the continuous peripheral rim 100a of the end-plate; it is bounded laterally by support plates 105 which each carry a positioning stud 106 and in each of which is provided a threaded bore 107. The aperture 104 extends in a generally radial direction towards the axis of the end-plate 100 to a flat portion formed on the cylindrical wall of the central sleeve 100b. The central sleeve 100b comprises, in the above mentioned flat portion, a notch 108 overlying the two track collecting ring 101; this notch has a substantially rectangular cross-section and is bounded by a central rim 108a situated substantially in the plane of the apertured radial wall of the end-plate 100; it is bounded laterally by two edges 108b extending parallel to the axis of the end-plate and inside the continuous peripheral rim 100a of the said end-plate. As will later be

described in more detail, the brush carrier assembly which is introduced inside the aperture 104 of the radial wall of the end-plate 100 engages the peripheral rim of the notch 108, the two side edges 108b of the said notch, being thus situated on either side of the two brushes which cooperate with the two track collecting ring 101.

The brush carrier assembly embodying the invention has been referenced by 109 in its entirety. The assembly 109 comprises a fixing plate 110 of which the two later edges are intended to press against the plates 105, and a carrier block 111 inside which are formed two identical wells 112 and 113, the axes of the two wells being parallel and situated in the median plane of the fixing plate 110. The axes of the two wells 112 and 113 intersect the axis of the rotor shaft 102 so that the brushes 114 which are arranged in the wells so as to be carried by the block 111; are arranged radially relative to the tracks of the ring 101. Each well 112 and 113 comprises, on each of its faces, regions in relief which define the walls along which the brush 114 slides; in this way the brush does not risk jamming against the corners of the wells 112 and 113. In this case, four grooves 114a are formed in each of the four corners of the wells, these grooves being recessed relative to the central walls of the wells on which slide a brush 114. The fixing plate 110 comprises two fixing holes 115 which, when the plate 110 is in position opposite the two plates 105, come face to face with the threaded bores 107 so as to allow the fixing of the plate 110 on the end-plate 100 by means of two screws which cooperate with the threads of the bores 107. The fixing plate 110 also comprises two positioning holes 116 of which one is slightly oval so as to ensure an easy positioning of the brush carrier assembly relative to the end-plate 100 of the stator.

On the end face of the carrier block 111 which is remote from that from which the two brushes 114 project is arranged a watertight stopper 121. This stopper is, in this embodiment, is constituted by an apertured band of deformable material such as rubber for example; the stopper 121 covers substantially all of the corresponding end face of the carrier block 111. Where it faces each well 112, 113, the watertight stopper 121 comprises a window 122. Each window 122 defines a rectangular opening of dimensions substantially similar to those of the wells 112, 113, the sides of the rectangular opening of a well being substantially merged with the corresponding sides of a facing window 122. To ensure the positioning of the two windows 122 relative to the two openings of the wells 112 and 113, the stopper 121 comprises in relief on each of the four corners of each rectangular window

122, a positioning stud 123. The positioning studs 123 are of a form complementary to the grooves 114a inside which they are intended to be inserted.

Metal strips 117 and 118 respectively are arranged above each of the wells 112 and 113 on the watertight stopper 121 positioned at the upper part of the carrier block 111. The strip 118 comprises an extension 118a which passes through an opening in the fixing plate 110 and which projects in front of this plate to provide a connecting terminal. The strip 118 is fixed in relation to the carrier block 111 by two fixing projections 118b which penetrate orifices 119 formed in the carrier block 111 on either side of the well 113, the widths of these orifices being greater at the upper part of the carrier block 111 than at its lower part. The projections 118b are folded in the region where they leave the orifices 119, which ensures the holding of the strip 118 onto the carrier block 111.

The strip 117 is folded back so that the part which covers the upper end of the wall 112 presses against the side of the carrier block 111 along a part 117a so that it abuts the fixing plate 110 which is intended to abut the plate 105 (this region has been referenced 117b). The strip 117 comprises a fixing projection 117c which penetrates an orifice 119 identical to those arranged on either side of the well 113; the fixing projection 117c is folded back along its lower part to ensure the fixing of the strip 117. The part 117a of the strip 117 comprises at its lower part an extension 117d that can be folded back under a projecting part of the carrier block 111 so as to ensure a perfect fixing of the strip 117 on the carrier block 111. When the fixing plate 110 is fixed against the plate 105 by fixing screws, the part 117b contacts the plate 105 and is therefore earthed since the end-plate 100 is at earth potential, the negative terminal of the vehicle battery being connected to earth. The brush 114 which is located in the well 112 corresponds therefore to the negative supply while the brush 114 arranged in the well 113 corresponds to the positive supply. In each of the two wells, the brush 114 is acted on by a spring 120 (see fig. 5) so as to tend to project out of the carrier block 111. Each brush is connected to a lead 120a which is soldered in a hole formed in the strips 117 and 118. The two metal strips 117, 118 each completely cover the peripheral edge of a window 122 formed in the watertight stopper 121 inserted between the wall of the carrier block and the two metal strips 117, 118. After the fixing by folding of the two metal strips 117, 118 to the carrier block, the wall of the watertight stopper 121 is pinched between the edge of the opening of a well and the metal strip

which is mounted over this well, so as to provide a watertight seal preventing the penetration, for example, of droplets or dust into the interior of each of the wells. It should be noted that the two windows 122 of the watertight stopper 121 each allow the passage of the lead 120a which connects each brush 114 to the corresponding metal strip 117, 118.

In order to mount and fix the watertight stopper on the brush carrier assembly 109, it is sufficient to position each of the windows 122 above a well 112, 113 by inserting four studs 123 into the corresponding slots formed in the sides of each well; a brush 114 connected by a lead 120a to a metal strip 117, 118 can then be introduced through the window 122 into each of the wells, and finally the two metal strips 117 and 118 which are mounted over the stopper 121 can be fixed by folding to the carrier block 111.

The carrier block 111 comprises a support flange 124 on each of its two side faces each flange 124 being adjacent the fixing plate 110 and adapted to abut the wall of the end-plate 1010 after mounting of the brush carrier assembly 109 on the alternator. Each support flange 124 is made in the form of a right-angled section; the wing 124a which is not connected to the body of the carrier block 111, extends along the side face of the carrier block parallel to the axis of the wells 112, 113 and it is turned towards the two-track collecting ring 101. The flange 124 is adapted to be applied, by its wing 124a, against one of the side edges of the notch 108 provided in the central sleeve 100b. The end region of the carrier block 111 which is nearest the collecting ring 101 projects slightly in relation to the fixing plate.

To mount the brush carrier assembly on the alternator, the carrier block 111 is inserted in the aperture 104; the fixing plate 110 is applied to the two plates 105 by pressing the positioning studs 106 into the positioning holes 116. During this positioning operation, the lower edge of the fixing plate 110 faces the central rim 108a of the notch, while the support ribs 124, integral with the carrier block 111, are applied against the two side edges 108b of the said notch.

To prevent particles, particularly of dirty water, from reaching the two-track collecting ring 101 and oxidizing it, by entering between the peripheral edge of the notch 108 and the wall of the brush carrier assembly abutting the said peripheral edge, a watertight seal referenced 125 in its entirety is provided. The watertight seal 125 comprises a U-shaped member of elastically deformable material such as rubber for example. Each wing 126 of the member 125 comprises a longitudinal slot 127 having a form complementary to the support rib 124

of the carrier block 111. The corresponding support rib 124 of clips inside the corresponding longitudinal slot 127 so that the carrier block 111 rests on the two edges 108b by means of the two wings 126 of the member 125 forming the watertight seal. The body 128 of the seal 125 is intended to abut the central rim of the notch 108. It is applied against the part of one face of the carrier block below the fixing plate 110; the fixing plate 110 is therefore mounted over the body 128 of the member 125 and forms, as can be seen in the drawing, a pad projecting along the axis of the stator in relation to the front face of the fixing plate.

The positioning of the watertight seal 125 is particularly easy to carry out; before mounting the brush carrier assembly on the alternator, the watertight seal is fixed by clipping the two wings 126 over the support ribs 124 of the carrier block 111 by bringing the central body 128 up against the front projecting face of the carrier block 111, so as to attach without the possibility of it coming loose, the seal 125 to the brush carrier assembly 109. After completion of this operation, the brush carrier assembly of the alternator can be positioned and then fixed by screwing the fixing screws into the holes 115 and the threaded bores 107. The plate 110 does not completely cover the entrance of the aperture 104 so as to provide a ventilation passage. It should be noted that the peripheral rim 100a of the end-plate 100 is continuous above the aperture 104 and is not interrupted to allow passage of the brush carrier assembly.

#### WHAT WE CLAIM IS:—

1. An electrical machine brush carrier assembly comprising a fixing plate adapted to be applied against an end-plate of a stator of the machine, a carrier block secured to the fixing plate, at least two wells formed in the carrier block, each well containing a brush, the two wells being arranged in a line perpendicular to the fixing plate, one end of the well which is nearest the fixing plate being covered with a metal strip having an extension providing a terminal and projecting through the said fixing plate, the said metal strip being connected electrically to a lead of the brush of the well which it covers and one end of the well which is furthest from the fixing plate having a further metal strip mounted over it which, after folding, lies along a rear face of the fixing plate, the said further strip being electrically connected to a lead of the brush arranged in the well which it covers.

2. A brush carrier assembly according to Claim 1, wherein the fixing of each metal strip is carried out by folding at least one fixing projection over an appropriate region of the carrier block.

3. A brush carrier assembly according to Claim 2, wherein a fixing projection of each strip is inserted in an orifice having an axis parallel to the axis of the wells of the block, each well being associated with two identical orifices arranged symmetrically in relation to the plane passing through the axes of the two wells.

4. A brush carrier assembly according to any one of Claims 1 to 3, wherein the fixing plate comprises at least one positioning aperture for cooperating with a positioning stud carried by the end-plate of the stator on which the brush carrier assembly is to be fixed.

5. A brush carrier assembly according to any one of Claims 1 to 4 wherein the fixing plate is adapted to be fixed on the end-plate of the stator by at least one screw perpendicular to the fixing plate.

6. A brush carrier assembly according to any one of Claims 1 to 5, wherein between at least one of the metal strips and the corresponding wall of the carrier block, is placed a stopper of deformable material, the said stopper being apertured to allow the electric connection of the metal strip with the lead of the brush arranged in the well which it covers, this stopper ensuring the watertight connection of the edge of the orifice of the above mentioned well and the said metal strip.

7. A brush carrier assembly according to Claim 6, wherein the stopper is a single watertight stopper inserted between the carrier block and the two metal strips.

8. A brush carrier assembly according to Claim 7, wherein the watertight stopper comprises a respective window facing each of the two wells for allowing the electric connection of the respective metal strip with the lead of the brush arranged in the well over which the said strip is mounted.

9. A brush carrier assembly according to Claim 8, wherein the edge of each window of the watertight stopper is completely covered by the metal strip which is mounted over the said window.

10. A brush carrier assembly according to Claim 8 or 9, wherein the central region of each of the walls of the wells is in relief relative to the lines joining the intersections of the said walls to provide slots or grooves inside which corresponding positioning studs, formed in relief at each of the corners of the windows formed in the watertight stopper, are inserted.

11. A brush carrier assembly according to any one of Claims 6 to 10, wherein the watertight stopper is in the form of a strip of elastomeric material.

12. A rotary electrical machine comprising a stator and a rotor, the rotor having a winding supplied by a two-track collecting ring by means of a brush carrier assembly

cooperating with the said collecting ring, the brush carrier assembly being fixed on an end-plate of the stator, and being an assembly according to any one of Claims 1 to 11.

13. A machine according to Claim 12, wherein the end-plate on which the brush carrier assembly is fixed comprises an apertured radial wall in which an aperture is formed for receiving the brush carrier assembly, the said radial wall being connected to a central sleeve inside which are arranged a bearing member supporting the rotor shaft and the two-track collecting ring placed on the said shaft.

14. A machine according to Claim 13, wherein the aperture formed in the radial wall of the stator end-plate with which the brush carrier assembly cooperates, is partly covered by the fixing plate of the said brush carrier assembly.

15. A machine according to Claim 13 or 14, wherein the peripheral wall of the central sleeve comprises, overhanging the collecting ring, a notch formed therein, this notch being bounded by two side edges arranged on either side of the two brushes and by a central edge which is situated

substantially in the plane of the apertured radial wall of the end-plate and which faces the aperture in which the brush carrier assembly is received.

16. A machine according to Claim 15, wherein a watertight seal is inserted between the peripheral rim of the notch and the brush carrier assembly wall which abuts against the said peripheral rim of the notch assembly, the last mentioned watertight seal allowing the free passage of the brushes which cooperate with the collecting ring.

17. A machine according to Claim 16, wherein the last-mentioned watertight seal is U-shaped and of a deformable material, the said U-shape abutting the peripheral rim of the notch of the central sleeve.

18. A brush carrier assembly substantially as herein described with reference to and as illustrated in the accompanying drawings.

19. An electrical machine substantially as described with reference to and as illustrated in the accompanying drawings.

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Sheet 1











